

On-site wastewater treatment systems

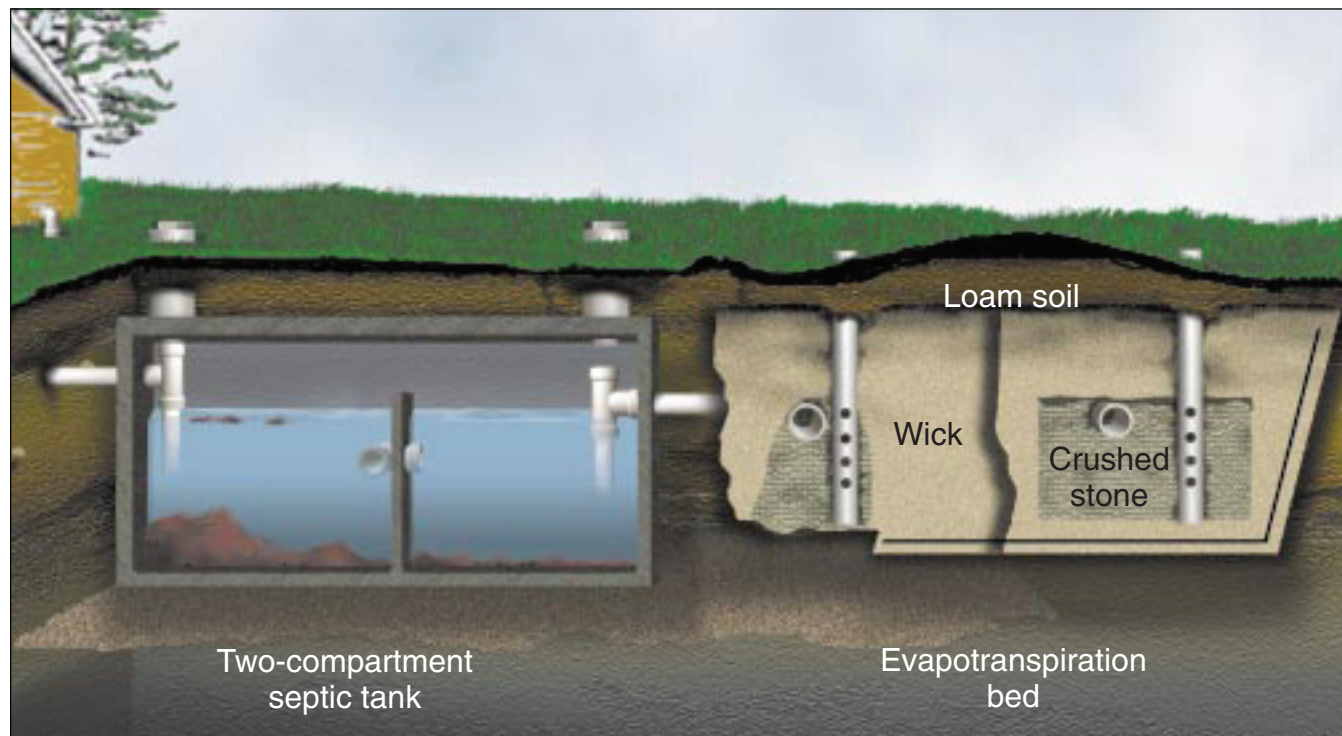


Figure 1: An evapotranspiration bed system.

Evapotranspiration bed

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An evapotranspiration (ET) bed treats wastewater by using evapotranspiration — the loss of water from the soil by evaporation and by transpiration from plants growing there.

ET beds are used where the soil cannot treat wastewater before it percolates to groundwater, such as in rocky soils, or where the soil prevents wastewater from percolating from the application field, such as in heavy clay soils.

ET systems are designed according to local evapotranspiration and rainfall rates, which vary across Texas. The local authorized agent, generally the local health department or regional office of the Texas Natural Resource Conservation Commission,

can tell you what the rates are in your area. ET bed systems can be smaller in drier regions of the state compared to the same size household in wetter locations. These systems do not work in very wet areas where more rain falls than is evaporated or transpired.

There are two types of ET beds: lined and unlined. In lined systems, the ET bed is lined with a natural clay, synthetic or concrete liner. A liner is required if the surrounding soil is very permeable, such as in sandy gravel or karst limestone.

Unlined systems can be used in highly impermeable soils such as heavy clays. In unlined systems, wastewater is disposed of by a combination of evaporation, transpiration and absorption, which is often called an evapotranspiration/absorption (ETA) system.

Grass cover is important for transpiration of wastewater

Treatment

In ET bed systems, solid materials are removed from the wastewater by a septic tank. Then the wastewater is distributed throughout the ET bed system. There, final treatment and disposal occur when the water evaporates and plants use nutrients in the effluent and release moisture through transpiration.

As the water evaporates, salts, minerals and solids from the effluent accumulate in the bed. During very wet periods when evapotranspiration is low, ET beds store water until drier periods when it evaporates and transpires.

Design

An ET bed contains storage trenches, loam backfill around the trenches and sandy loam soil over the top of the loam backfill for grass growth. Generally, the required bed surface area is divided between two beds, which allows for switching between the beds to avoid overloading.

A liner and sand cushion are placed in the ground, and the storage system is set on the bed bottom. Generally, the storage system consists of a bed of rocks or gravel of a uniform size ranging from $\frac{3}{4}$ -inch to 2 inches in diameter, filling the bed to a depth of 12 inches or less, depending on the bed's overall depth. Distribution pipes are placed no more than 4 feet apart and no more than 2 feet from the bed walls. The top of the distribution pipe must be flush with the top of the rock media.

Other types of media such as tire chips, or storage systems such as leaching chambers, may be used for the storage trenches.

A water-permeable soil barrier (a geotextile filter fabric) is placed over

the rock. A loam soil is added to fill the bed to within two inches of the top. Selecting the proper soil is extremely important in building an ET system. (State regulations classify the soil as a class II, loamy soil.) The soil draws the water toward the surface faster than coarse sand.

Wicks incorporated into the rock media draw water continuously from the rocks into the soil and toward the surface area, where it evaporates or is taken up by plants. A wick is a column of soil that extends through the rock media to the bottom of the bed. The total wick area should be 10 to 15 percent of the bed surface and should be uniformly spaced throughout the bed.

After the loamy soil is in place, the final two inches are filled with sandy loam and mounded in the center with a slope of 2 to 4 percent toward the outside of the bed. The last step is to plant vegetation specially selected to transpire the most water, such as bermudagrass or St. Augustine grass. Placing grass sod over the bed may be the best approach to establishing grass there. Using seed may let the mounded soil wash away during heavy rainfall before the grass is established. Larger plants with shallow root systems, such as evergreen bushes, may also be used to help take up water.

If you use grasses with dormant periods, be sure to provide adequate vegetation on the beds during these periods. A common solution is overseeding with winter grasses to provide year-round transpiration.

How to keep it working

A valve connecting the two beds allows you to alternate the wastewater inflow between each bed. When one bed becomes saturated, turn the valve to send effluent into the other underloaded bed. An inspection port added

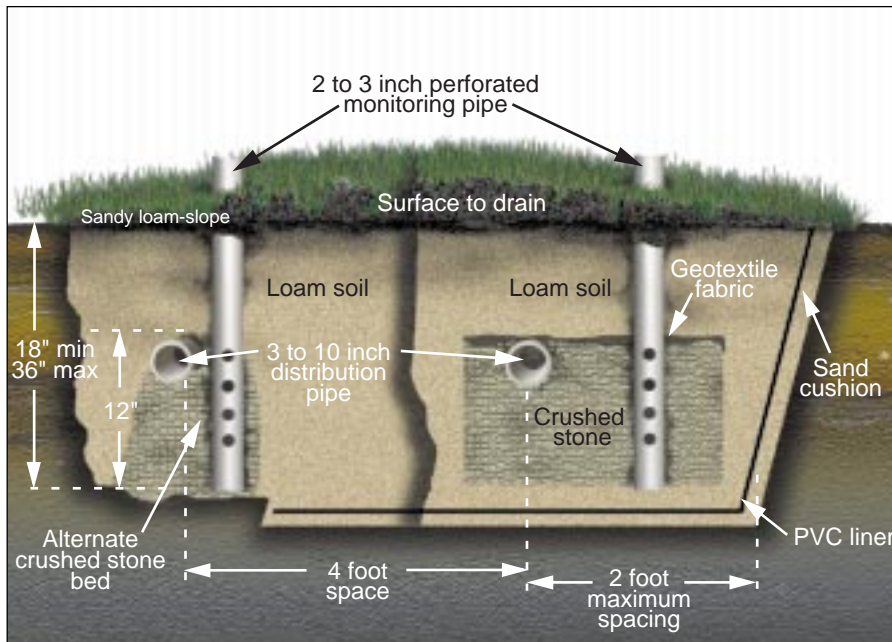


Figure 2: *Evapotranspiration beds should be built as shallow as possible, from 18 inches to a maximum of 36 inches deep.*

to each bed will help you determine each bed's water levels during use. Covering the port prevents insects, small animals and unauthorized people from getting to the bottom of the bed.

Here's how to maintain your ET bed properly:

- ✓ Mow the grass cover regularly. Grass cover is important for transpiration of wastewater. Overseed with a cool-season grass to provide transpiration in winter. If you do not maintain the grass cover, the system will probably fail.
- ✓ Divert rainfall runoff around the system. The system is designed to handle normal rainfall entering from the top of the system, but excessive rainfall will overload it. Rainfall runoff from buildings and paved areas can add too much water to the ET bed. This water must be diverted around the

system. Maintain the sloped cover on the system to help rain run off the bed.

- ✓ Check the vegetation growing on the system as the system matures. You may need to use salt-tolerant grasses, such as bermuda-grass, because salt accumulates in the system. Water leaves salts in the soil when it evaporates. Harvesting the salt-tolerant grasses may reduce the salts in the system if the plants can accumulate the salt in their leaves. The potential for high salt concentrations depends on how much salt is in the water supply.
- ✓ Develop good water conservation habits at home. Excessive water use overloads the system and causes failure.

To keep the beds aerobic and prevent clogging, build them as shallow as possible, from 18 inches to a maximum of 36 inches deep.

Divert rainfall runoff around the system

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